

AGRICULTURAL POWER SYSTEMS II

Curriculum Content Framework

Prepared By

Chris Adams, St. Joe
Tommy Brown, Marvell
Jerry Gilliam, Greene County Tech
Mike Vines, DeQueen
Jerry Yates, Centerpoint

Facilitated By

Karen Chisholm, Program Manager
Office of Assessment and Curriculum
Arkansas Department of Workforce Education

Edited By

Angela Collins, Program Adviser
Office of Agricultural Science and Technology
Arkansas Department of Workforce Education

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Curriculum Content Framework

AGRICULTURAL POWER SYSTEMS II

Grade Levels: 10, 11, 12
Course Code: 491130

Prerequisites: Agricultural Power Systems I

Course Description: This course covers agricultural power and agricultural machinery, including the maintenance and repair of equipment. Principles of power are covered along with hydraulics, individual farm equipment parts, and machinery management.

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Unit 1: Introduction to Agricultural Power Systems

5 Hours

Terminology: Agricultural mechanics, Mechanization

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
1.1 Define terms		Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
1.2 Explain how power systems are important to agriculture		Foundation	Reading	Applies information to job performance [1.3.4] Determines what information is needed [1.3.10]
		Personal Management	Organizational Effectiveness	Comprehends the organization's modes of operation [3.3.5]
		Thinking	Creative Thinking	Makes connections between seemingly unrelated ideas [4.1.6]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
1.3 Discuss career opportunities involving agricultural power systems and machinery	1.3.1 Research a career in agricultural power and machinery to determine the training needed, working conditions, and pay scale	Foundation	Reading	Uses standard occupational resource materials [1.3.22] Uses written sources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Writing	Organizes sentences into paragraphs [1.6.11] Produces neat, legible document from typewriter or computer [1.6.15]
		Personal Management	Career Awareness, Development, and Mobility	Explores career opportunities [3.1.6] Identifies continuing changes in male/female roles at home and work [3.1.7] Identifies education and training needed to achieve goals [3.1.8]
		Thinking	Knowing how to Learn	Uses available resources to acquire new skills or improve skills [4.3.4] Processes new information as related to the workplace [4.3.5]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
1.4 Identify FFA activities and programs of interest to students in agricultural power and machinery		Foundation	Listening	Evaluates oral information/presentation [1.2.2] Receives and interprets verbal messages [1.2.8]
		Personal Management	Career Awareness, Development, and Mobility	Sets well-defined and realistic personal/career goals (short-term and long-term) [3.1.11]
		Thinking	Knowing how to Learn	Uses available resources to acquire new skills or improve skills [4.3.4] Uses available resources to apply new skills [4.3.6]

Unit 2: Safety Considerations in Agricultural Power

5 Hours

Terminology: Decibel, Noise duration, Noise intensity

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
2.1 Define terms		Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
2.2 Explain the hazards associated with agricultural power		Foundation	Reading	Applies information and concepts derived from printed materials [1.3.3] Determines what information is needed [1.3.1.]
2.3 Identify the safety colors used in the agriculture mechanics lab	2.3.1 Inspect the agriculture mechanics lab to determine if proper safety colors are being used	Foundation	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5]
		Personal Management	Organizational	Applies knowledge to implement work-related system or practice [3.3.4]
		Thinking	Creative Thinking	Combines ideas or information in a new way [4.1.2]
2.4 Discuss the proper clothing and equipment that should be used when working with agricultural power equipment		Foundation	Speaking	Applies/Uses technical terms as appropriate to audience [1.5.2] Organizes ideas and communicates oral messages to listeners [1.5.7]
		Thinking	Seeing Things in the Mind's Eye	Organizes and processes images—symbols, pictures, graphs, objects, etc. [4.6.2]
2.5 Identify the classes of fire		Foundation	Science	Applies life-saving techniques [1.4.4]
		Thinking	Knowing how to Learn	Applies new knowledge and skills to assist in identifying classes of fire. [4.3.1]

Unit 3: Principles of Power

5 Hours

Terminology: Tachometer, Torque, Vacuum

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
3.1 Define terms		Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
3.2 Define the different units of work		Foundation	Arithmetic/ Mathematics	Converts different units of measurement [1.1.17]
			Writing	Performs basic computations [1.1.31]
3.3 Explain torque		Thinking	Problem Solving	Uses technical words and symbols [1.6.20]
				Demonstrates logical reasoning in reaching a conclusion [4.4.2]
		Foundation	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5]
				Pronounces words correctly [1.5.9]
		Interpersonal	Coaching	Helps others learn new skills [2.1.3]
		Thinking	Seeing Things in the Mind's Eye	Visualizes a system's operation from schematics [4.6.3]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
3.4 Identify different types of power	3.4.1 Solve problems associated with the different principles involved in power	Foundation	Science	Applies a scientific principle to solve a problem [1.4.8] Constructs hypothesis [1.4.11]
		Thinking	Creative Thinking	Finds new ways of dealing with existing problems/situations [4.1.5]
			Problem Solving	Identifies possible reasons for problem [4.4.6]

Unit 4: Hydraulics

20 Hours

Terminology: Bleed, Cylinder, Hydraulics

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.1 Define terms		Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
4.2 List the different systems on a tractor that are controlled by hydraulics		Foundation	Listening	Listens for content [1.2.3]
			Writing	Summarizes written information [1.6.17] Writes/prints legibly [1.6.24]
		Thinking	Creative Thinking	Combines ideas or information in new way [4.1.2] Makes connections between seemingly unrelated ideas [4.1.6]
			Problem Solving	Comprehends ideas and concepts related to hydraulics [4.4.1]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.3 Explain the difference between the two types of hydraulic systems		Foundation	Speaking	Participates in conversation, discussion, and group presentations [1.5.8] Pronounces words correctly [1.5.9]
		Personal Management	Responsibility	Exerts a high level of effort and perseverance toward goal attainment [3.4.4]
		Thinking	Decision Making	Evaluates information/data to make best decision [4.2.5]
			Knowing how to Learn	Processes new information as related to workplace [4.3.5]
4.4 Identify the components of a hydraulic system and their functions		Foundation	Listening	Listens for content [1.2.3] Listens to follow directions [1.2.6]
		Personal Management	Responsibility	Sets high standards for self in completion of task [3.4.9]
		Thinking	Knowing how to Learn	Develops personal learning strategies—note taking, clustering related items, flash cards, etc. [4.3.2] Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.5 Compare the basic types of pumps		Foundation	Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2] Evaluates written information for appropriateness/content/clarity [1.6.9] Presents own opinion in written form in a clear, concise manner [1.6.14]
		Thinking	Creative Thinking	Combines ideas or information in a new way [4.1.2] Makes connections between seemingly unrelated ideas [4.1.6]
			Reasoning	Determines which conclusions are correct when given a set of facts and a set of conclusions [4.5.3]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.6 Explain the different hydraulic control valves	4.6.1 Check for hydraulic leaks	Foundation	Science	Follows safety guidelines [1.4.16]
	4.6.2 Change a hydraulic oil filter		Speaking	Uses verbal language and other cues, such as body language, appropriate in style, tone, and level of complexity to the audience and the occasion [1.5.14]
	4.6.3 Connect hydraulic lines from equipment to a tractor, using quick disconnects	Personal Management	Integrity/Honesty/Work Ethic	Complies with safety and health rules in a given work environment [3.2.2] Follows established rules, regulations, and policies [3.2.5]
		Thinking	Reasoning	Applies rules and principles to a new situation [4.5.1] Uses logic to draw conclusions from available information [4.5.6]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.7 Discuss the two kinds of cylinder action	4.7.1 Replace a hydraulic cylinder	Foundation	Writing	Presents answers/conclusions in a clear and understandable form [1.6.13] Uses language, style, organization, and format appropriate to subject matter, purpose, and audience [1.6.19]
		Personal Management	Responsibility	Exerts a high level of effort and perseverance toward goal attainment [3.4.4] Pays close attention to details [3.4.8]
		Thinking	Decision Making	Comprehends ideas and concepts related to cylinder action [4.2.2] Evaluates information/data to make best decisions [4.2.5]
			Problem Solving	Identifies possible reasons for problem [4.4.6] Interprets drawings to solve design problems [4.4.7]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.8 Identify the different types of hydraulic fittings	4.8.1 Demonstrate the ability to check hydraulic fittings and hoses for leaks	Foundation	Listening	Listens for content [1.2.3] Listens to follow directions [1.2.6]
		Personal Management	Responsibility	Sets high standards for self in completion of task [3.4.9]
		Thinking	Knowing how to Learn	Develops personal learning strategies—note taking, clustering related items, flash cards, etc. [4.3.2] Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]
4.9 List the types of hydraulic hoses		Foundation	Reading	Applies information to job performance [1.3.4] Draws conclusions from what is read [1.3.12] Analyzes effectiveness of performance evaluation system [3.3.2]
		Personal Management	Organizational Effectiveness	Comprehends the organization's modes of operation [3.3.5]
		Thinking	Reasoning	Sees relationship between two or more ideas, objects, or situations [4.5.5]

Unit 5: Power Transmission Components 20 Hours

Terminology: Clutch, Final drive, Transmission

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
5.1 Define terms		Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
5.2 Identify the different drive train components		Foundation	Listening	Listens for content [1.2.3] Listens to follow directions [1.2.6]
		Thinking	Knowing how to Learn	Locates appropriate learning resources to acquire new skills or improve skills [4.3.3]
5.3 Describe the characteristics of different clutches	5.3.1 Demonstrate the ability to adjust the free travel of the clutch pedal	Foundation	Listening	Listens for content [1.2.3] Summarizes written information [1.6.17]
			Writing	Writes/Prints legibly [1.6.24]
		Thinking	Creative Thinking	Combines ideas or information in a new way [4.1.2]
5.4 Identify the different types of transmissions		Thinking	Knowing how to Learn	Locates appropriate learning resources to acquire new skills or improve skills [4.3.3]
5.5 Identify the types of final drives		Thinking	Knowing how to Learn	Locates appropriate learning resources to acquire new skills or improve skills [4.3.3]

Unit 6: Individual Parts of Farm Equipment 20 Hours

Terminology: Antifriction bearing, Chains, V-belt

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.1 Define terms		Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
6.2 Describe the different types of tires and their care		Foundation	Speaking	Participates in conversation, discussion, and group presentations [1.5.8] Pronounces words correctly [1.5.9]
		Thinking	Creative Thinking	Combines ideas or information in a new way [4.1.2]
			Reasoning	Makes connections between seemingly unrelated ideas [4.1.6] Sees relationship between two or more ideas, objects, or situations [4.5.5]
6.3 Compare different types of tire defects and tire wear	6.3.1 Demonstrate the ability to remove and repair a tractor tire	Foundation	Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2] Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6]
		Personal Management	Responsibility	Pays close attention to details [3.4.8] Sets high standards for self in completion of a task [3.4.9]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.4 Identify different types of bearings	6.4.1 Demonstrate the ability to service bearings	Foundation	Reading	Analyzes and applies what has been read to a specific task [1.3.2] Comprehends written information, and applies it to a task [1.3.8]
		Thinking	Decision Making	Comprehends ideas and relationships related to safety practices when servicing bearings [4.2.2] Demonstrates decision-making skills [4.2.4]
			Knowing how to Learn	Uses available resources to apply new skills [4.3.6]
6.5 Discuss the different types of belts and chains	6.5.1 Work problems associated with pulley speeds 6.5.2 Demonstrate the ability to adjust belts	Foundation	Science	Applies scientific principles related to pulley speeds [1.4.5] Applies a scientific principle to solve a problem [1.4.9]
			Arithmetic/ Mathematics	Applies mathematic principles related to pulley speeds [1.1.4] Converts different units of measurement [1.1.17]
		Thinking	Seeing Things in the Mind's Eye	Imagines the flow of work activities from narrative descriptions [4.6.1] Visualizes a system's operation from schematics [4.6.3]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.6 Distinguish the different types of belts and chain wear	6.6.1 Determine safe wear patterns in order to select safe chains and belts	Foundation	Reading	Comprehends written specifications and applies them to a task [1.3.9] Determines what information is needed [1.3.10]
		Personal Management	Organizational Effectiveness	Applies knowledge to implement work-related system or practice [3.3.4] Comprehends ideas and concepts related to safety [4.2.2]
		Thinking	Decision Making	Considers risks when making a decision [4.2.4]
6.7 Identify the different types of hoses and lines and their functions		Foundation	Reading	Interprets drawings to obtain factual information [1.3.17]
		Thinking	Knowing how to Learn	Develops personal learning strategies—note taking, clustering related items, flash cards, etc. [4.3.2]
			Problem Solving	Demonstrates logical reasoning in reaching a conclusion [4.4.2]

Unit 7: Machinery Management

15 Hours

Terminology: Depreciation, Fixed costs, Variable costs

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
7.1 Define terms		Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
7.2 Describe the method for measuring machine capacity	7.2.1 Solve problems dealing with measuring machine capacity	Foundation	Arithmetic/Mathematics	Calculates measurements taken from measuring devices [1.1.9]
		Interpersonal	Teamwork	Contributes to group with ideas, suggestions, and effort [2.6.2] Takes an interest in what others say and do [2.6.5] Works effectively with others to reach a common goal [2.6.6]
		Thinking	Problem Solving	Devises and implements a plan of action to resolve a problem [4.4.3] Recognizes/Defines problem [4.4.8]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
7.3 List factors that cause time loss during machine operation		Foundation	Reading	Applies information to job performance [1.3.4] Draws conclusions from what is read [1.3.12]
		Personal Management	Organizational Effectiveness	Analyzes effectiveness of performance evaluation system [3.3.2] Comprehends the organization's modes of operation [3.3.5]
		Thinking	Reasoning	Sees relationship between two or more ideas, objects, or situations [4.5.5]
7.4 Identify examples of fixed cost		Foundation	Reading	Comprehends written information for main ideas [1.3.7] Identifies inaccurate information/entries on written documents [1.3.15]
		Thinking	Creative Thinking	Combines ideas or information in a new way [4.1.2]
			Knowing how to Learn	Processes new information as related to the workplace [4.3.5]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
7.5 Identify examples of operating costs		Foundation	Listening	Comprehends ideas and concepts related to operating costs [1.2.1] Listens for long-term contexts [1.2.7]
		Personal Management	Responsibility	Exhibits enthusiasm in approaching and completing tasks [3.4.3] Maintains a high level of concentration in completion of task [3.4.7]
		Thinking	Creative Thinking	Makes connections between seemingly unrelated ideas [4.1.6]
7.6 Discuss the different methods of determining the depreciation cost of equipment	7.6.1 Solve problems involving depreciation	Foundation	Arithmetic/Mathematics	Adds and subtracts to prepare a profit and loss statement [1.1.42]
		Interpersonal	Coaching	Helps others learn new skills [2.1.3]
		Thinking	Reasoning	Applies rules and principles to a new situation [4.5.1] Comprehends ideas and concepts related to depreciation [4.5.2]
7.7 Explain field capacity and effective field capacity	7.7.1 Figure effective field capacity	Foundation	Arithmetic/Mathematics	Computes using a formula [1.1.14] Uses basic numerical concepts in practical situations [1.1.32]
		Thinking	Knowing how to Learn	Uses available resources to acquire new skills or improve skills [4.3.4] Uses available resources to apply new skills [4.3.6]

Glossary

Unit 1: Introduction to Agricultural Power

1. Agricultural mechanics—the selection, operation, maintenance, service, sale, and use of power units, machinery, equipment, structures, and utilities in agriculture
2. Mechanization—the efficient use of machines to assist in all areas of production, processing, and marketing

Unit 2: Safety Considerations in Agricultural Power

1. Decibel—the standard unit of sound
2. Noise duration—the length of time a person is exposed to a sound
3. Noise intensity—energy in sound waves

Unit 3: Principles of Power

1. Tachometer—a device for measuring the rotating speeds of objects
2. Torque—a twisting force; the turning effect of a force
3. Vacuum—the absence of atmospheric pressure

Unit 4: Hydraulics

1. Bleed—a process by which air is removed from a hydraulic system
2. Cylinder—a device for converting fluid power into linear or circular motion
3. Hydraulics—use of liquids to transfer force

Unit 5: Power Transmission Components

1. Clutch—a mechanism for engaging and disengaging the power input of a motor or an engine to the driven machine
2. Final drive—the last stage in the transmission of power from the engine to the drive wheels or power take-off shaft
3. Transmission—a mechanism that controls the rate of release of energy from the driving engine to the source of application

Unit 6: Individual Parts of Farm Equipment

1. Antifriction bearing—a needle, roller, or ball bearing
2. Chains—made of steel and can be of four common types: roller, detachable link, pintle, and conveyor steel roller
3. V-belt—a tough corded material and rubber formed to a specific trapezoidal shape

Unit 7: Machinery Management

1. Depreciation—the loss of value of a machine or piece of equipment due to age, use, or obsolescence
2. Fixed costs—those costs that occur annually regardless of amount of use of a machine, equipment, or building
3. Variable costs—all costs (other than fixed costs) that are associated with machine or equipment operation